DOCUMENT RESUME

ED 191 387 HE 013 058

AUTHOR Nathenson, Michael B.
TITLE Bridging the Gap Between Teaching and Learning at a Distance.
INSTITUTION Open Univ., Walton, Bletchley, Bucks (England). Inst. of Educational Technology.
PUB DATE Sep 78
NOTE 21p.: Not available in paper copy due to marginal legibility of original document.
AVAILABLE FROM Open University, Institute of Educational Technology, Walton Hall, Milton Keynes MK7 6AA, England

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Course Evaluation: Course Organization: Educational Objectives: Educational Technology: Foreign Countries: Higher Education: *Material Development: Open Universities: Self Evaluation (Individuals): *Student Attitudes: *Teacher Developed Materials: Teaching Methods: *Textbook Evaluation
IDENTIFIERS Open University (Great Britain)

ABSTRACT

Open University faculty create their own instructional materials for use in distance teaching. A methodology is described for evaluating the teaching effectiveness of the materials and the teaching methods used. It is applied to a unit of a materials science course written for a specific text. A small group of students in the course was surveyed for their reactions to the method and text. They responded to questions about the instructor's outline, course objectives, the introduction to the unit, instructions on how to study the text, the study strategy itself, specific course activities (experiments to be conducted at home), self-assessment questions included by the instructor in the unit, and questions in the text. Ten suggestions are made about the importance and usefulness of the course elements evaluated by the study. (MSE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED191387

IET

Institute of Educational Technology
The Open University
Walton Hall
Milton Keynes MK7 6AA

Telephone (0908) 63546

COURSE
DEVELOPMENT
GROUP

BRIDGING THE GAP BETWEEN TEACHING AND LEARNING AT A DISTANCE

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Open University

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

MICHAEL B. NATHENSON

ABSTRACT

Unlike teachers in traditional Universities, Open University teachers are faced with the very difficult task of having to produce course materials for students learning at a distance. Typically, Open University materials include a number of adjunct teaching aids which encourage students to become actively involved in the learning process (e.g., aims and objectives, study guides, self-assessment questions, in-text summaries, etc.). Unfortunately, few of these teaching aids have systematically been evaluated. Open University teachers simply do not know, for example, whether a list of objectives placed at the beginning of a course unit actually helps students to learn the related material. This paper describes a methodology for helping Open University teachers find out whether the particular teaching practices they adopt are successful. The effectiveness of the methodology is evaluated.

September 1978

HE 013 058

CD6 Correspondence texts/Developmental testing/Technology/Self assessment methodology

Bridging the Gap between Teaching and Learning at a Distance

Abstract

Unlike teachers in traditional Universities, Open University teachers are faced with the very difficult task of having to produce course materials for students learning at a distance. Typically, Open University materials include a number of adjunct teaching aids which encourage students to become actively involved in the learning process (e.g., aims and objectives, study guides, self-assessment questions, in-text summaries, etc.). Unfortunately, few of these teaching aids have systematically been evaluated. Open University teachers simply do not know, for example, whether a list of objectives placed at the beginning of a course unit actually helps students to learn the related material. This paper describes a methodology for helping Open University teachers find out whether the particular teaching practices they adopt are successful. The effectiveness of the methodology is evaluated.

AUG 25 1980

Bridging the Gap between Teaching and Learning at a Distance

INTRODUCTION

Open University (OU) teachers are faced with the very difficult task of having to communicate with students at a distance. To do so, they aim to produce course materials which encourage students to become actively involved in the learning process. Unlike textbooks which are usually written to convey information about content in a subject area, OU courses try to create materials which are designed to teach.

During the past three years, I have been examining the way in which OU course materials are designed and have identified a number of common teaching strategies. These are set out below.

(1) Study chart

(2) Preliminary list of terms, concepts principles to be introduced

(3) Aims and Objectives

(4) Introduction

(5) Study Guide or section on how to tackle material

(6) Flagging of terms, concepts, principles

(7) In-text questions followed by answers

(8) Prose questions followed by discussions

(9) Self-assessment questions

(10) In-text summaries (usually at the end of sections)

(11) Links with other material (e.g., set books; reprints of articles, documents, papers, etc.; television and radio programmes; discs, cassettes; exercise booklets).

(12) Specific activities (e.g., home experiments, field studies, computer work)

(13) End-of-unit summaries, checklists, or review exercises.

Whilst all of these strategies aim at the same educational end - to help students learn more effectively and efficiently - few have been systematically evaluated. OU teachers do not know, for example, whether a list of objectives placed at the beginning of a course unit actually helps students to learn the related material. Nor do teachers know very much about how students respond to various types of self-assessment questions, yet they are included in one form or another in virtually all Open University course materials.

During the past year I have made progress toward developing a methodology for helping teachers find out whether the particular teaching practices they adopt are successful. This paper describes that methodology in detail and evaluates its effectiveness with one OU teacher.

THE METHODOLOGY

A teacher in Materials Science expressed interest in evaluating a unit of teaching material written around a set book. His first step was to read through the unit and try to indicate those places where he had made specific decisions about the teaching. The first such decision was to include a Study Chart designed to help students see the relationships between the sections of correspondence text, the chapters of the set book, and the home experiments. The chart was followed by three aims and fifteen behaviourally-stated objectives designed to tell students what they should be able to do after

completing the unit. The next section of the unit was an introduction and included a decision by the teacher to adopt one of the strategies common to OU courses listed earlier in the paper - the idea of linking correspondence text to other material. Moving on, the teacher indicated that he had decided to include a section describing the way in which the unit was structured and suggest a strategy for tackling it. The strategy is outlined below:

> "This text is arranged on the basis that you will study the selected parts of the set book chapter by chapter. Before each set reading I specify those sections I consider to be essential and indicate those which you could omit if you were short of time. Each set reading is preceded by one or two general questions which are intended to help you focus your thoughts as you study. The following section of text then provides answers to these questions as well as summarizing any other key points made in the chapter. You may like to know the answer and summary before tackling the relevant chapter or, alternatively, perhaps you would rather read the chapter, making your own list of what you consider to be the most important points and compare them with the answers and summary afterwards."

Other teaching decisions included the insertion of in-text questions followed immediately by the answers, self-assessment questions with answers at the end of the unit, and detailed notes to students describing procedures for carrying-out three home-based experiments.

The second step in evolving a methodology for helping teachers find out about the effectiveness of their own teaching practices was to produce a set of questions designed to obtain student feedback about the course material being evaluated. These so-called feedback questions - FBQs - took a variety of forms. Some were closed-ended multiple-choice type questions which offered economies of time for data processing, while others were more open-ended, allowing students to comment freely. Figure 1 gives an example of an FBQ designed to

obtain information about how studen ts reacted to the fifteen objectives placed at the beginning of the unit text.

Fig. 1 about here

Figure 2 is an example of one of many feedback questions designed to elicit students' reactions to the particular study strategy suggested by the author.

Fig. 2 about here

The next step was to evolve a procedure for collecting the feedback data. There appeared to be two options available: students could either answer the FBQs after completing their study of the unit (i.e., a standard post hoc questionnaire) or they could answer questions during their study of the unit (i.e., following relatively small sections of teaching material). The end-of-unit questionnaire suffers from the very serious problem of forgetting. After one week (12-15 hours) of intermittent study, OU students are not likely to be able to provide useful feedback about their reactions to the early and middle bits of the teaching.

It was therefore decided to adopt a modified version of the Integrated Feedback System successfully used in developmental testing projects at the Open University in 1976-78 (Henderson and Nathenson, 1976; Henderson, Hodgson, and Nathenson, 1977). Each feedback question was interpolated into the unit text at a point immediately following the particular teaching strategy to which it referred. It was hoped that this close proximity would enable the students to provide feedback about various aspects of the teaching while the teaching was still

FBQ 2

2a How did you react to reading the Objectives for Unit 7? (e.g., What did you do with them?) Did you read them rather quickly, read them more than once, read each one carefully, make a precis of them, or what?

2b How did you feel after reading the Objectives? Did they make you want to get into the subject matter, put you off, or what?

2c How helpful were the Objectives at this stage?

( ) I decided that a thorough reading at this stage would not benefit me

( ) I found the Objectives very helpful in telling me what I will be learning in the unit

( ) I think these objectives will be more useful to me in revision work and plan to return to them at a later time.

Any other comments:

2d Did you have any difficulty in understanding what is meant by any of the Objectives? If so, please specify.

2c Approximately how long did you spend reading the Objectives?

ANY OTHER COMMENTS

Fig. 1: An Example of a Feedback Question on Objectives

FBQ 6

6a Did you write your answers to the three set questions before checking the author's suggested answers in Section 3.1?

Question 1 ( ) Yes
( ) No

Question 2 ( ) Yes
( ) No

Question 3 ( ) Yes
( ) No

6b If you did not answer all three, please say why not.

6c How closely did your answers compare to the author's?

Question (1)

Question (2)

Question (3)

6d How helpful did you find the three questions in structuring your reading of Chapter 2?

ANY OTHER COMMENTS

Fig. 2 A feedback Question on Study Strategy

fresh in their minds. For example, the FBQ relating to the Objectives (see Figure 1) would be answered by students immediately after reading the Objectives, the question on Study Strategy would follow the author's section on Study Strategy and so on.

It was decided to use coloured flags to direct students to answer a specific FBQ. For example, after reading through the Objectives, students would see a rad flag reading PLEASE DO FBQ 2 NOW. They would then turn to their list of FBQs, complete FBQ 2 and return to the teaching text. A flag would then direct them to do FBQ 3 and so on.

The final step was to select a sample of students to provide the teacher with feedback. It was agreed that the most useful feedback would come from students who were studying the unit for real. Twenty students were asked to participate, all of whom were formally registered on the course containing the unit being evaluated. These students were told that their feedback would be helpful in designing similar teaching material in the future.

RESULTS

Fourteen of the 20 students returned the feedback questions. The results are summarised below:

The Study Chart

The Study Chart was included at the beginning of the Unit to help students see the various relationships between the sections of correspondence text, the chapters of the set book, and the home-based experiments. The feedback indicated that only three of the 14 students found the Study Chart to be a helpful teaching aid [illegible] used the chart in their study of the unit.

Aims and Objectives

These were intended to communicate to students in a very specific way precisely what they could expect to learn from the Unit material. Feedback indicated that most students (over 75%) spent ten minutes or less reading the three pages of text covering three aims and fifteen detailed objectives. Less than one-fourth of the students stated that they read the Objectives carefully. The two main reasons given for the cursory read-through were (a) the large number of unfamiliar terms and concepts in one place and (b) the intention of students to use the list of Objectives after reading through the Unit. The following comment from one student summarised the general feelings in the group:

> "If objectives are extensive and in a completely new language, one can experience a feeling of 'good heavens - another lot!' - particularly if the course to date has been a bit of a slog! They would mean more if integrated at strategic points in the text, and reproduced at the end of the unit".

The Introduction

The Introduction to the Unit was written primarily to stimulate the students' interest in the study of Materials Science. Feedback indicated that it did, in fact, arouse the interest of most students. Students also found the use of humorous historical illustrations to be amusing. Half said the illustrations made their study of the Introduction more enjoyable.

Section on How to Study the Text

This section was included to explain to students how the material in the Unit is structured around the set book and to suggest a particular way of tackling it. (The strategy outlined previously.)

As such, it is one of the most important sections of text in the Unit. Feedback indicated that after reading this section, nine of 14 students planned to follow the author's advice for studying the Unit. However, five students said they would not; instead, they would concentrate first and foremost on completing the obligatory assessment items (computer and tutor marked assignments) associated with the Unit and then, if time permitted, they would pay some attention to the author's "organising questions and answers".

The Study Strategy Itself

When asked retrospectively whether students did, in fact, follow the author's strategy, it is interesting that all but one student indicated that they had. This means that four of the five students who planned to concentrate primarily on the assignments did find the time to work through the author's study questions as well. Of the 13 students who followed the author's strategy, 12 indicated that it was an effective way of teaching around a set book. Three students, however, said that they would have preferred the book to be written as an OU type of teaching text.

It is important to point out that students used the author's suggested strategy in very different ways. Only two used the questions to focus their thoughts ahead of time on the key issues raised in the text. Three read the chapter first, made notes on the material in the set book, and compared their notes to the author's answers. The largest number of students (seven of 13) used the questions and the answers primarily for revision purposes - i.e., in much the same way as they used the objectives.

The following sequences were typical of the different orders in which students chose to study. There was no single preferred order.

Questions, Set Book, Answers
Set book, Questions, Answers
Set Book, Notes on Book, Questions, Answers
Questions, Set Book, Answers - then Re-read Book, Re-read Questions, Re-read Answers

Throughout the text, students were asked via feedback questions whether they wrote their answers to the author's organising questions before checking the suggested answer. There were seven sets of questions referring to seven chapters in the set book. On the first two sets of questions, about a third of the students said they wrote their answers before checking, the other two-thirds said they mentally "thought-out" their answers. As the Unit progressed, however, this pattern changed. The number of students writing answers steadily increased so that by the final two sets of questions, nearly two-thirds of the students were writing answers which were shorter, but similar, to the author's. For those students whose answers differed, they indicated that they had re-read the material to see where they had gone awry.

Specific Activities: The Home Experiments

There were three home-based experiments associated with the Unit, each having its own objectives communicated clearly to students before beginning. Twelve, 11 and 13 of the 14 students attempted the first, second, and third experiments respectively and nearly all found them interesting. Similarly, nearly all indicated that

the instructions were clear and that the experiments had helped them to understand the related material, especially in clarifying theory. Students spent approximately an hour on each of the first two experiments and 20 minutes on the third. This is double the amount of time predicted by the author in his introductory comments.

Self-Assessment Questions (SAQs)

In his suggestions on how to tackle the Unit, the author indicated that SAQs were included in the text for students to test themselves on their understanding of the main points. There were nine SAQs embedded in the Unit with answers provided at the end of the text. Because SAQs are considered by most course designers at the OU to be a very important part of the process of helping students learn at a distance, a rather detailed analysis of students reaction to the nine SAQs in the Unit was conducted. A summary of the main points arising out of the analysis follow:

- About one-fourth of the students conscientiously wrote their answers to all nine of the SAQs. These "model" students indicated that they had tried to answer all the SAQs from the first Unit of the course onwards and planned to continue to answer SAQs in later units.

- About one-fourth of the students did not answer any of the nine SAQs. This group of students frankly said that their top priority was their overall course assessment grade and that SAQs were very low on their priority scale. These "assessment conscious" students geared their study of the Unit solely to answering the required assessment assignments.

- The majority of the students (about 50%) answered <u>some</u> of the SAQs. The multiple choice type of SAQ and SAQs which involved mathematical calculations were answered by the highest proportion of students, whilst those that required lengthy written answers (e.g., discuss this; what do you think would happen if.... and why), were answered by the lowest proportion of students.

- A large proportion of students commented spontaneously that they could not see the relationship between the SAQs and the Unit objectives. Several said that they might have tried a particular SAQ if they were given a clear reason for answering it - e.g., to test themselves on an objective that ultimately would be assessed on an assignment.

- Students felt that the teaching leading up to some of the SAQs did not adequately prepare them for answering the questions and, consequently, these SAQs were not attempted. Students expressed the need for more concrete examples preceding SAQs and, in the case of some of the mathematical SAQs, models of how to work similar types of problems.

- A common problem in many of the more discursive (non-mathematical) SAQs was the clarity of the questions themselves. Students often were not clear about <u>what</u> the question was asking, <u>how</u> to respond to it, and, in some cases, <u>why</u> the question was important to answer. For example, here is an SAQ that caused confusion.

SAQ 4

Thinking in terms of stress concentration, cracks and dislocations, how in principle do you think solids could be made stronger? Do not consider the structural mechanisms required.

SAQ 4 (Answer)

(1) The most obvious thing to do is to ensure that the solid does not contain cracks, either internally or on the surface; this is why whiskers are so strong.

(2) The surfaces of solids should also be perfectly smooth, that is, they should contain no surface steps which act as concentrations of stress.

(3) If cracks and surface steps cannot be prevented (and in practice they cannot for bulk solids) the radius of curvature at their tips should be increased so that they become less potent stress concentrations.

(4) In ductile metals, the higher the stress required to move dislocations then the stronger is the material. So, dislocation movement must be made difficult.

(5) As you will see in later chapters of the set book, methods 3 and 4 are adopted in certain materials.

Of those students who responded, most got the first two points, but very few mentioned the last two. In their comments, students said if the author had wanted them to note four points, then he should have rephrased the format of the question.

- Several students commented that they did not know what to do when they got an SAQ or a part of an SAQ wrong. This seemed to be particularly worrying to the "model" students who felt that re-reading the same material again would not help them to diagnose their problem.

In-Text Questions

At the Open University, in-text questions are usually regarded as a less important teaching aid than self-assessment questions. They are included primarily to engage students in a kind of "tutorial-in-print". Here are three examples of different types of ITQs used in the Unit.

ITQ 1

Does the force remain constant as you change the angle of the ruler to the vertical?

No. The force decreases as the ruler nears the vertical.

ITQ 2

Why do you think the change of slope may not be as sharp when the specimen yields?

The answer lies in the fact that not all of the dislocations created in a material begin to move and multiply at the same stress; it is a gradual process with more and more dislocations becoming involved as the stress is increased.

ITQ 3

What is the relationship between the Forces F_1 and F_2 acting on a balance, which is in equilibrium, with a balance arm of length L and the pivot placed a distance d from the line of acting F_1? A diagram of the balance arm is given in Figure 19.

The clockwise moment is $F_2 (L - d)$. The anticlockwise moment is $F_1 d$. For the equilibrium these must be equal.

$$F_2 (L-d) = F_1 d$$

$$F_1 = \frac{L-d}{d}$$

In general, most students did not write their answers to ITQs but either thought about them or read them as part of the text, depending upon the type of question being asked. For example, in the first ITQ, a "yes-no" type of question, the feedback indicated that most students mentally worked out their answers. Similarly, the second ITQ was not commonly read as part of the text; the "model" students indicated that they often thought about the question and then tried to answer it mentally before reading the answer. The third ITQ, a mathematical type of question, elicited written responses from the "model" students but was read as part of the text by the other students. The main reasons given by students for not treating ITQs seriously were lack of time and their apparent unimportance in relation to SAQs and to the advanced questions preceding the set book readings.

CONCLUSIONS

The results of the study led to a number of suggestions for retaining some of the strategies for teaching at a distance and for re-structuring some of the others. The most important suggestions included:

(1) The study strategy used by the author is an effective way of teaching around a set book, even though students use the strategy in very different ways.

(2) Home-based experiments are effective in helping students to understand related course material, especially when the material is theoretical.

(3) The course objectives should be integrated into the text to reinforce concepts already taught.

(4) A list of all the objectives should be included at the end of the text to serve as a revision checklist.

(5) A section of text suggesting alternative ways of tackling the course material is an important aid to study.

(6) Self-assessment questions should be introduced only when one is reasonably certain that the teaching leading up to the SAQ has adequately prepared the student for responding correctly.

(7) Each self-assessment question should include a rationale for answering it (e.g., this SAQ is important because it tests an objective that will be assessed at a later time), as well as a realistic estimate of the amount of time students are likely to spend in preparing an answer.

(8) The wording and format of an SAQ play an important part in determining whether a student answers it (e.g., if you want students to mention four points, tell them so and provide space for them to compose their answers).

(9) If possible try to anticipate "wrong answers" to SAQs and offer suggestions for correcting the reason why students went wrong. If there is more than one correct answer, let students know that there are other acceptable alternatives.

(10) In-text questions are perceived by students as a relatively unimportant part of the teaching-learning process. As such, authors should seriously consider whether the effort involved in producing them is a worthwhile expenditure of their time and energy.

It should be emphasised that these ten suggestions apply only to one teacher's strategy for teaching in one unit of one course. The results

are not necessarily generalisable to other teaching units written by the same teacher nor to material written by other authors. The methodology for generating the feedback from students is, however, generalisable and can be applied to any prose text, regardless of subject matter, length, or style of presentation. It is hoped that other teachers at distance teaching institutions like the Open University who lack the benefit of face-to-face feedback will be encouraged to follow this teacher's example and find out whether their particular teaching practices are effective. With their help, we might well move closer to bridging the ever widening gap between teaching and learning at a distance.

References

1. Henderson, E.S. and Nathenson, M.B., "Developmental Testing: An Empirical Approach to Course Improvement". PLET, 13: 4, 31-42, 1976.

2. Henderson, E.S., Hodgson, B.K., and Nathenson, M.B., "Developmental Testing: The Proof of the Pudding", Teaching at a Distance, 10, 77-82, 1977.

COURSE DEVELOPMENT GROUP PAPERS

CD1 NOTES ON THE EARLY STAGES OF COURSE PLANNING
by Philippe Duchastel, Roger Harrison, Euan Henderson, Barbara Hodgson, Adrian Kirkwood, Robert Zimmer

CD2 HOW TO USE CONSULTANTS SUCCESSFULLY
by Judith Riley

CD3 DISCUSSING AND EVALUATING DRAFTS
by Judith Riley

CD4 ASSESSMENT
by Judith Riley

CD5 INTRODUCING NEW FACULTY MEMBERS TO COURSE PRODUCTION
by Philippe Duchastel and Roger Harrison